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Understanding Emotion in Relation to Drinking Motivation

Melissa C. Hinely
Georgia Southern University

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By
Melissa C. Hinely

Under the mentorships of Dr. Jessica J. Brooks

ABSTRACT

Recent research has uncovered the interactions between implicit alcohol motivations and drinking behaviors after emotion inductions (Ostafin & Brooks, 2011). However, little research has supplemented such findings. This longitudinal two-part study examined the impact of a personalized emotion induction on implicit alcohol-related associations in a college sample enrolled at southern university. 215 participants were randomly assigned to one of three emotion-induction conditions (negative, neutral, or positive). During phase I, participants completed a baseline Implicit Association Tests (IAT; Greenwald et al., 1998) to assess implicit alcohol-related cognitions related to valence and motivation. Based on condition, participants were also asked to describe in detail a recent negative, neutral, or positive experience that would later be used to induce emotion in phase II. 88 participants returned for phase II. Participants listened to an individualized guided imagery recording intended to induce the emotion of their assigned condition. The same IATs from phase I were administered post-emotion induction. Due insufficient power, significant changes in alcohol-related cognitions after the emotion induction, regardless of assigned condition, were not observed. However, implicit alcohol motivation was significantly correlated to impulsivity problems, and implicit valence-related alcohol associations were significantly correlated with engagement in problematic drinking practices, difficulties controlling alcohol consumption, and several drinking motives. Implications and limitations of findings, as well as future areas of research, are discussed.

Key words: Implicit cognition, alcohol use, emotion, drinking motivation

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Dr. Jessica J. Brooks

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Dr. Steven Engel

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Understanding Emotion in Relation to Drinking Motivation

Scientists have become increasingly interested in the domain of substance use and abuse over the decades as the result of a growing number of alcohol-related incidents among college students between the ages of 18 and 24. Each year, an estimated 1,825 college students die due to alcohol-related accidental injuries (e.g., car crashes), 696,000 students are assaulted by another intoxicated student, and 97,000 students are victims of reported sexual assaults or date rape (National Institute of Alcohol Abuse and Alcoholism [NIAAA], 2015). Roughly 25% of college students report problems in school caused by their drinking, such as missing class and doing poorly on exams (NIAAA, 2015). These statistics have led researchers to delve deeper into the motivational processes behind alcohol use, abuse, and alcohol dependency.

The majority of research conducted in the field of alcohol abuse is on college students, who have been found to participate in more binge drinking activities than their same-aged peers not enrolled in college (Substance Abuse and Mental Health Services Administration [SAMHSA], 2012). Binge drinking has been defined as "a pattern of drinking that brings blood alcohol concentration (BAC) levels to 0.08 g/dL," (NIAAA, 2014, para. 2). This BAC level is typical after drinking four alcoholic beverages for women and five for men within two hours. In contrast, SAMHSA classifies binge drinking as an instance where someone, male or female, drinks at least 5 alcoholic beverages on the same occasion. In 2012, SAMHSA found 40.1% of full-time college students engaged in binge drinking in contrast to their peers, who reported binge drinking 35% of all drinking occasions.

In addition to the growing number of college students that are participating in binge drinking activities, researchers have found a high co-morbidity rate between personality disorders and alcohol use disorders. Approximately 17.6 million American adults meet criteria for an alcohol use disorder, which Mayo Clinic defines as "a pattern of alcohol use that involves problems controlling your drinking, being preoccupied with alcohol, continuing to use alcohol even when it causes problems, having to drink more to get the same effect, or having withdrawal symptoms when you rapidly decrease or stop drinking" (Mayo Clinic Staff, 2015, para. 1). A staggering 28.6% of people with an alcohol use disorder and 47.7% of those suffering with a substance use disorder also meet criteria for at least one personality disorder (Grant et al., 2006). Grant et al. found that 16.4% of their respondents with at least one personality disorder met criteria for current alcohol use disorder, and those diagnosed with alcohol use disorder also showed a higher prevalence to be diagnosed with antisocial, obsessive-compulsive, and paranoid personality disorders. Mood disorders are also frequently co-occurring with substance use disorders. In a study of 11,737 individuals with a diagnosed alcohol use disorder, 42% (N = 5,003) also met criteria for at least one mood or anxiety disorder. The individuals with co-morbid alcohol use disorders with mood and/or anxiety disorders were more likely to be female, to meet the criteria for a personality disorder, and to meet criteria for alcohol dependence instead of solely alcohol abuse (Kaufmann, Chen, Crum, & Mojtabai, 2014). These statistics continue to increase, giving more incentive for researchers to figure out why more students are abusing alcohol, which could potentially lead to alcohol dependency in the future.

Problematic Alcohol Use and Motivation to Drink

Addiction is a disease affecting many aspects of a person's life. According to the American Society of Addiction Medicine (ASAM), addiction is classified as "a primary, chronic disease of brain reward, motivation, memory and related circuitry…characterized by the inability to consistently abstain, impairment in behavioral control, craving, diminished recognition of significant problems with one's behaviors and interpersonal relationships, and a dysfunctional emotional response," (ASAM, 2011, para.1-2). Addictions often involve cycles of relapse and remission, can result in disability, and can cause premature death like other diseases. Excessive alcohol use is not only linked to increased probability of alcohol dependence, it has also has been found to increase the risk for chronic diseases, such as liver cirrhosis, pancreatitis, cancer, elevated blood pressure, and psychological disorders; accidental injuries; violence; and Fetal Alcohol Syndrome and Sudden Infant Death Syndrome if a mother drinks while pregnant (Centers for Disease Control, 2014).

A study conducted by Wiers, van Woerden, Smulders, and de Jong (2002) found that alcohol addiction develops gradually regardless of if the drinker starts to dislike consuming alcohol. In other words, even if a person does not *want* to consume alcohol, after a certain point they begin to feel as if they *must*. This is also presented in Robinson and Berridge's incentive sensitization theory of addiction (2008). This theory explains how repetitive exposure to addictive drugs can, in certain individuals and circumstances, alter brain circuitry that normally regulate the rewarding effects attached to stimuli, making the desire to use out of the person's control. Heavy drinkers in the Wiers et al. (2002) study were found to strongly associate alcohol and arousal automatically (i.e., on

an implicit level measured by a computerized task), whereas light drinkers were found to have weaker implicit associations between alcohol and arousal.

Despite the negative effects of alcohol abuse being commonly known, many people still have strong motivations to drink. Alcohol expectancies also play a large part in predicting alcohol behavior (Jajodia & Earleywine, 2003). These expectancies are the beliefs that people hold regarding the physical, psychological, and/or interpersonal experience(s) one may have as a result of drinking alcohol. While both drinking expectancies and drinking motives influence a person's likelihood of drinking, their attitudes towards alcohol itself are more central and ingrained in a person's being (Cooper, 1994).

According to Cox & Klinger (1988), people are driven to drink in order to change their current internal emotional state. Some engage in alcohol use to enhance positive emotion, while others drink to reduce negative emotion. While some drink in response to emotional cues, others drink due to external influences, like being rewarded with social acceptance. These internal and external motives combine to form four classes: (a) internally generated, positive reinforcement motives (drinking to enhance positive emotion), (b) externally generated, positive reinforcement motives (drinking to obtain positive social rewards), (c) internally generated, negative reinforcement motives (drinking to reduce negative emotion), and (d) externally generated, negative reinforcement motives (drinking to avoid social rejection) (Cooper, 1994). Drinking to reduce negative affect, like reducing tension and anxiety, has been shown to lead to maladaptive coping (Ivory & Kambouropoulus, 2012), which in turn may lead to alcohol abuse and addiction.

It is believed that adolescents are motivated to drink primarily by reinforcement in social situations—mainly to enhance social standing (approval of peers) and to avoid social costs (rejection and judgment from a respected group). Peer alcohol use and attitudes regarding alcohol influence adolescent drinking behavior so strongly that drinking behavior in an adolescent can be predicted by their peers' attitudes and actions (Cooper, 1994). While Cooper (1994) stated that social context influences an adolescent's likelihood of consuming alcohol, the motivation to conform was unrelated to heavy or frequent alcohol use, except in younger adolescents where the desire to be accepted was more common. In Cooper's (1994) study, negative reinforcement motives were significantly positively related to drinking problems, where positive reinforcement motives were not. These findings show that those that either drink to reduce negative emotion or to avoid social rejection (internally generated and externally generated negative reinforcement motives, respectively) are at a higher risk for alcohol-related incidents than those that are motivated to drink by other factors.

Several studies have been constructed to examine how inducing a mood may alter a person's implicit associations with alcohol-related concepts and cravings. Implicit associations are thought processes that occur subconsciously, so they appear to be automatic instead of deliberate. In a study by Cho et al. (2008), researchers developed a virtual reality (VR) system that was intended to induce social pressure in order to study how such pressures influence a person's mood and subsequent alcohol cravings. Participants that experienced the social pressure induction reported higher desires to drink than participants that did not experience the social pressure induction. These participants were more likely to drink in order to conform to social cues and demands

than because they desired the alcohol itself. In a separate study by Birch et al. (2008), enhancement-motivated drinkers were found to have an amplified implicit association between *alcohol* and *reward* when they underwent the positive mood induction, but no reaction to the negative emotion induction. The study also induced negative emotion in some participants. However, the negatively induced participants showed no alteration, meaning that negative mood did not influence their implicit alcohol associations, contrary to their hypothesis (Birch et al., 2008).

Measuring Implicit Cognition with the Implicit Associations Test

Implicit and explicit cognition measurements are commonly used to analyze a person's underlying drinking motivations. Explicit cognition is often measured with questionnaires and other tasks that require conscious, intentional response selection. Implicit cognition, contrary to explicit cognition, is measured by analyzing reaction times on computerized tasks (Birch et al., 2008). The computerized tasks target automatic, subconscious cognitions and compare how response times differ for various topics (e.g., race, alcohol, violence) and associations (e.g., good, bad, safe, dangerous).

The Implicit Associations Test (IAT; Greenwald, McGhee, & Schwartz, 1998) is a computer-based test that measures the strengths of implicit associations between topics. The test observes response latencies with the computer-administered categorization tasks, and it has been found to reveal attitudes and other automatic associations that are typically taboo and subject to presentation bias, such as racism. In theory, an assumption that is made by the IAT is that responses are faster when stimuli that are associated together more strongly in one's mind are paired on the same key (e.g., *flower* and *pleasant* might be more strongly associated than *garbage* and *pleasant*). Following this

assumption, it would be expected that someone who enjoys consuming alcohol would match *alcohol* and *approach* more quickly than they would match *alcohol* and *avoid*.

In a study by Jajodia and Earleywine (2003), an IAT was used to measure the strength of associations with alcohol concepts (e.g., *beer*, *wine*, *shot*) to positive or negative outcomes. Negative associations are caused by events in which the person associated consuming alcohol with a negative outcome, like an arrest for driving under the influence or a fight with a friend, while positive associations are caused by memories in which alcohol was involved in a positive situation, like a wedding or graduation reception where alcohol was consumed. The IAT results showed that those that reported negative alcohol associations due to past experiences actually showed weak positive correlations with alcohol use variables. These results indicated that participants matched *alcohol* and *avoid* slightly faster than they matched *alcohol* and *approach*, suggesting that these particular individuals are drinking *in spite* of negative associations with alcohol, not *because* of them.

Manipulating emotion has been found to influence the strength of implicit alcohol-related cognition. A two-part study by Ostafin and Brooks (2011) found that negative emotion increased the strength of automatic motivational process related to alcohol. In the first phase, participants completed a baseline measure of implicit alcohol-related cognition (approach-avoid IAT), paper-and-pencil questionnaires regarding alcohol-related behaviors, and completed a guided imagery script (of a personally relevant negative or neutral content, depending on the assigned condition). The second phase occurred several weeks later and required participants to listen to a personalized recording based on the provided script they wrote in the first phase, followed by a re-test

of the IAT. For those who were classified as coping-motivated drinkers, the negative emotion induction increased the strength of the automatic alcohol-approach associations on the IAT. Non coping-motivated drinkers were not influenced by the negative emotion induction. These results were the first to document the influence of emotion on a coping-motivated participant's implicit motivation to consume alcohol.

Purpose of Present Study

Outside of Ostafin and Brooks' study (2011), no research has examined how emotions influence a person's automatic alcohol motivation (i.e., desire to approach or avoid alcohol). The current study will replicate and expand Ostafin and Brooks' 2011 study by using a personalized guided imagery script to induce a particular mood followed by an assessment of changes in automatic alcohol associations with the Implicit Associations Test. This study will expand upon their method by having different levels of emotional induction (i.e., positive, negative, and neutral conditions, rather than negative and neutral only) to see how different emotional experiences influence strength of alcohol-related cognitions in coping- and enhancement-motivated drinkers. The results of this study will hopefully contribute to the field of substance use and abuse by supporting prior findings that emotions can alter a person's automatic motivational processes in relation to alcohol consumption.

Hypothesis 1.1. Based on the findings of Ostafin and Brooks (2011), participants identified as high in coping-motivation for drinking are expected to show strengthened alcohol-approach associations following the negative emotion induction.

Hypothesis 1.2. Strong enhancement-motivated drinkers are anticipated to show stronger alcohol-approach associations following a positive induction of emotion.

Hypothesis 1.3. Both coping-motivated and enhancement-motivated drinkers are expected to show no change after a neutral emotion induction.

Exploratory Aim. This study seeks to determine if strength of implicit alcohol-related cognitions can be accounted for by self-reported problematic drinking behaviors, as well as the experience of negative alcohol-related outcomes.

METHODS

Participants

This study collected data on two separate days (which will be referred to as 'phases' henceforth), and participant information is presented by phase. A total of 215 participants completed the phase I of this study. The participants consisted of college students (male: *n* = 77, 35.8%; female: *n* = 138, 64.2%). In order to participate in the study, students must have been 18 years or older. In phase I, students (M = 19.51) ranging from 18 years old (*n* = 57, 26.5%) to 32 years old (*n* = 2, 0.9%) participated. Each student received course credit for the undergraduate psychology course in which they were enrolled at Georgia Southern University. Participants learned of and signed up for the study through the online SONA system, an organizational recruitment website presenting multiple studies of varying interests. The majority of the participants reported their sexuality to be heterosexual (*n* = 200; 93%), while 7% reported to be gay (*n* = 4; 1.9%), lesbian (*n* = 1; 0.5%), and other (*n* = 10; 4.6%). Students described their alcohol use as "never used" (*n* = 9; 8.4%), "past, not current use within the last 3 months" (*n* = 41; 38.3%), and "current use in the last 3 months" (*n* = 57; 53.3%). The self-reported race of participants was White/Caucasian (*n* = 131; 60.9%), Black/African American (*n* = 74; 34.4%), Hispanic/Latino (*n* = 4; 1.9%), Pacific Islander/Hawaiian Native (*n* = 1; 0.5%), Native American/Alaskan Native (*n* = 1; 0.5%), and multiracial (*n* = 4; 2.9%).

The rate of attrition from phase I to phase II was 59%, with a total of 88 participants completing phase II. The average age of the participant pool in phase II was 19.28 years (SD = 1.52). The majority of participants were female (*n* = 54; 61.4%) and identified as heterosexual (*n* = 77; 87.5%), with 3 participants identifying as gay and

another 3 participants identifying as bisexual. 55.7% of participants identified as White/Caucasian (n = 49), 31.8% as Black/African American (n = 28), 2.3% as Hispanic/Latino (n = 2), 1.1% as Pacific Islander/Hawaiian Native (n = 1), and 3.4% as multiracial (n = 3).

Measures

Demographics. Participants completed a demographics questionnaire that included items related to age, sex, gender, race/ethnicity, sexual orientation, education status, and involvement with alcohol use.

Problematic Drinking Behavior. The Alcohol Use Disorder Identification Test (AUDIT; Saunder, Aasland, Babor, de la Fuente, & Grant, 1993) provided an index of problematic drinking. The AUDIT is a 10-item screening questionnaire that assesses drinking behaviors, consumption, and alcohol-related problems in a 12-month period. Answers are ranked on a Likert-type scale ranging from 0 (*never*) to 4 (*daily/almost daily*). The total score could range from 0-40, with a score of 8 or higher indicating problematic drinking behaviors. The AUDIT has demonstrated consistent internal reliability in Korean populations (Kim et al., 2013). In the present study, the AUDIT produced an internally reliable score ($\alpha = 0.82$).

Drinking Motivation. Participants completed the Drinking Motives Questionnaire-Revised (DMQ-R; Cooper, 1994), a self-report questionnaire used to examine reasons for drinking alcohol. The DMQ-R is composed of 20 questions with answers on a Likert-type scale ranging from 1 (*almost never/never*) to 4 (*almost always/always*). The questionnaire produces scores for four different drinking motive subscales: Coping, Enhancement,

Social, and Conformity. Coping (α = 0.84), Enhancement (α = 0.92), Social (α = 0.94), and Conformity (α = 0.77) subscales showed adequate internal reliability.

Consequences of Alcohol Use. The Drinker Inventory of Consequences (DrInC; Miller, Tonigan, and Longabaugh, 1995) assessed participants' adverse experiences resulting from their alcohol consumption. The participants were asked how often specific negative consequences have occurred as a result of their drinking within the past 3 months. Answers were reported using a Likert-type scale ranging from 0 (*never*) to 3 (*daily, almost daily*). The 50 DrInC statements are divided into 5 subscales: Physical, Intrapersonal, Social Responsibility, Interpersonal, and Impulse Control consequences. Each of the subscales demonstrated adequate internal reliability in the current study: Physical (α = 0.73), Intrapersonal (α = 0.85), Social Responsibility (α = 0.76), Interpersonal (α = 0.76), and Impulse Control (α = 0.80).

Mood Assessment. During each phase of the study, participants completed the Self-Assessment Manikin (SAM; Bradley & Lang, 1994), a non-verbal visual assessment technique. The SAM measures a person's emotional reaction to a variety of stimuli by presenting them with five side-by-side images representing emotions ranging from an unhappy, frowning figure to a happy, smiling figure. This is an efficient measure that only takes about 15 seconds to complete, and is widely used because of its ability to transcend age, culture, and language barriers (Morris, 1995). Participants completed the SAM during the later portion of Phase I, then again at the beginning and end of Phase II.

Emotion Induction Task. Participants were administered a guided imagery prompt developed by Sinha et al. (2008) during Phase I based on their condition. They responded to the prompt by describing a recent event in which they experienced negative (condition

1), neutral (condition 2), or positive (condition 3) emotions. These responses were then used to create an individualized emotion induction script, which was written and recorded by a research assistant. Each personally relevant guided imagery task lasted approximately five minutes. Negative scripts were mostly about deaths in the family, difficult breakups, and struggles adjusting in college. Neutral scripts commonly involved instances of meditation, while positive responses included getting accepted to college, weddings, and winning sports tournaments.

Implicit Alcohol-Related Cognitions. A series of Implicit Association Tasks (Greenwald et al., 2003) assessed participants' alcohol-related cognitions related to attribute categories of valence (good-bad; IAT-gb) and motivation (approach-avoid; IAT-aa) at baseline and post-emotion induction. For both the IAT-gb and IAT-aa, the target stimuli were *water* and *beer* and were presented pictorially (i.e., a set of five pictures of both water and beer beverages in clear glasses or pitchers). The IAT-gb attribute categories represented five words each related to concepts of *good* (e.g., positive, excellent) and *bad* (e.g., awful, terrible).

Participants completed the IATs in random order during Phase I and in counterbalanced order in Phase II. The IATs, each consisting of seven blocks, were administered on a computer where categories were displayed on the top corners of the computer screen with stimuli presented in the middle. Blocks 1 and 2 were practice rounds where the participant was able to familiarize themselves with the IAT format and practice matching the stimuli with the correct categories. For example, the categories *good* and *bad* or *approach* and *avoid* would be placed on the top left and right corners of the screen in block 1. Stimuli (words corresponding to the categories) would then pop up

in the center of the screen. Participants would press either the "E" or "I" key to categorize the stimuli with the left or right category, respectively. In block 2, the categories would change to either *beer* or *water*, with stimuli ranging from pictures and words relating to both categories. In blocks 3 and 4, congruent categories were grouped together—*water* was matched with *approach/good*, and *beer* with *avoid/bad*. Block 5 was similar to block 1, except the categories were repositioned in the opposite corners. Blocks 6 and 7 were similar to block 3, but with incongruent categories—*water* matched with *avoid/bad* and *beer* with *approach/good*.

An IAT score is a reaction time-based score. The IAT score is *D*-algorithm (Greenwald et al., 2003) that is calculated by taking the difference in mean response scores from the congruent block (alcohol-good/water-bad) and the incongruent block (alcohol-bad/water-good)—the larger the IAT score, the stronger the association is thought to be held in the participant's mind with regard to the congruent block (e.g., alcohol-good). Differences in scores from phase I (baseline) and phase II (post-emotion induction) can be compared to see if an emotion induction is able to influence participants' associations with alcohol.

Manipulation Check. After completing the emotion induction task and subsequent Implicit Association Tests, participants ranked the vividness of the emotion induction recording by completing the Vividness of Imagery Scale (VIS; Marks, 1973). This scale asked the participants to rank the vividness of the recording on a Likert-type scale ranging from 1 (*perfectly clear and as vivid as the actual situation*) to 7 (*no image present at all, you're only "knowing that" you are thinking of the situation*). In the current study, participants rated the guided imagery as effective (M = 2.12; SD = 1.20).

Design

The current study implemented a longitudinal experimental design. Prior to completing the study, participants were randomly assigned to one of three conditions (negative, positive, or neutral). The study in its entirety was administered on computers using MediaLab v.12 and INQUISIT 11 software packages, with the exception of the guided imagery script construction task that was hand written. All self-report measures were administered to participants in random order, with exception to the SAM and VIS, which were administered immediately following the Emotion Induction Task. In Phase I, the IATs were randomized within their block and then counterbalanced in Phase II to account for ordering effects. See Appendix I for further design-related details.

Procedure

All participants signed up for both phases of the study via the online SONA system. The study was conducted in the AMP Health laboratory located in Brannen Hall on Georgia Southern University's campus. A maximum of 3 participants were allowed to complete the experiment per session. During Phase I, participants entered the lab, read the informed consent forms, and upon consent completed a battery of computerized self-report measures, two computerized Implicit Association Tasks (IAT-aa and IAT-gb). Then, depending on their assigned condition, they were given writing prompts asking them to describe a negative, neutral, or positive situation they had recently experienced. When participants completed the implicit measures on INQUISIT and the self-report questionnaires on MediaLab, they were debriefed, awarded credit, thanked for their participation, and reminded of their next appointment.

The following week, participants returned to the lab for Phase II of the study. Participants sat at the computer that matched their self-created subject ID from Phase I. After reading and signing the informed consent forms, the participants completed a measure of self-reported mood prior to listening to the 5-minute guided imagery emotion induction task. Immediately following the emotion induction, participants completed measures of mood and vividness of the imagery task, followed by re-administration of the IAT-aa and IAT-gb (counterbalanced from the previous phase). Following completion of the IATs, participants were debriefed and given a copy of the debriefing sheet, were thanked for their participation, and awarded credit for their participation.

RESULTS

Preliminary Analyses

Based on the mean AUDIT score of 7.31 (*SD* = 5.83), a measure of hazardous drinking practices, this sample is approaching problematic drinking levels, though still considered to be social. With regard to drinking motivation, participants reported their primary reason for engaging in alcohol consumption as to enhance social experiences (DMQ-R social: *M* = 15.12; *SD* = 6.10), followed, in order, by enhancement of positive emotion (DMQ-R enhance: *M* = 12.86; *SD* = 5.99), alleviation of or escape from negative emotion (DMQ-R cope: *M* = 9.42; *SD* = 4.30), and to fit in with peers (DMQ-R conform: *M* = 7.41; *SD* = 2.99).

A correlational analysis was conducted to assess relationships between implicit measures of alcohol-related cognition and self-report alcohol use and alcohol-related negative consequences. Notably, valence (IAT-gb) and motivation (IAT-aa) measures of implicit alcohol-related cognition were significantly correlated $r = .47$, $p < .001$. Specifically, implicit alcohol-approach associations (IAT-aa) were positively correlated with problems with impulsivity (DrInC-Impulsive), $r = 0.16$, $p = .02$, whereas implicit alcohol-good associations (IAT-gb) were positively correlated with hazardous drinking practices (AUDIT), $r = .15$, $p = .03$, and difficulties controlling use (DrInC-control), $r = .15$, $p = .02$ (see Table 1 in Appendix 2).

A second correlational analysis assessed relationships between implicit measures of alcohol-related cognition and self-reported motivation for drinking. Implicit valence (IAT-gb) and motivation (IAT-aa) scores were significantly correlated, $r = .46$, $p < .001$. Implicit alcohol-good scores were positively correlated with self-reported social

motivation (DMQ-R_social), $r = 0.17$, $p = .02$, motivation to alleviate negative emotion (DMQR_coping), $r = 0.18$, $p = .01$, and motivations to enhance emotion (DMQ-R_enhance), $r = 0.19$, $p = .01$, as well as engagement in problematic drinking practices (AUDIT), $r = 0.18$, $p = .01$. In contrast, implicit motivation (IAT-aa) scores were not significantly correlated to self-reported drinking motives (DMQ-R) or problematic drinking practices (AUDIT) (see Table 2 in Appendix 3).

Effectiveness of the Emotion Induction

A series of paired sample t-tests were conducted to determine effectiveness of guided imagery mood induction in manipulating self-reported mood. A significant increase in negative emotion post-emotion induction was seen for those in the stress condition, $t(25) = -3.89$, $p = .001$, Cohen's $d = -.61$. For those in the positive condition, a significant increase in positive mood was observed following the guided imagery task, $t(27) = 2.553$, $p = .02$, Cohen's $d = .26$. As expected, participants in the neutral condition reported no significant changes in mood following the neutral emotion induction, $t(28) = 1.00$, $p = .33$.

Impact of Emotion on Implicit Alcohol-related Cognition

A series of mixed-model Analysis of Variance (ANOVA) were conducted to determine the effects of emotion on implicit alcohol-related motivation and valence from baseline (phase I) to post-emotion induction (phase II) (Hypotheses 1.1, 1.2, and 1.3). As a result of attrition and power concerns, participants within each condition could not be further separated by self-reported drinking motivation; therefore, the original hypotheses were unable to be tested. Alternatively, changes in implicit cognition were generally

analyzed by group condition. Assumptions of colinearity and normality were met prior to data analysis.

Results revealed no significant change in implicit alcohol-approach motivations from baseline measurement to post-emotion induction, regardless of condition. Specifically, a significant main effect of implicit alcohol motivation (IAT-aa) was not obtained following the emotion induction, F (1, 70) = 1.54, p = .22, partial η^2 = .02, with implicit cognitions becoming slightly more alcohol-avoidant from baseline to Phase II for all groups. Marginal means of participant IAT-aa scores at baseline and post-emotion induction are depicted in Graph 1 (see Appendix 6. A significant main effect for condition was not found, F (2, 70) = .22, p = .81, partial η^2 = .01. The interaction of condition on strength of alcohol-approach associations was non-significant, F (2, 70) = .43, p = .65, partial η^2 = .01.

Results also showed no significant change in implicit alcohol-related valence motivations from baseline measurement to post-emotion induction across conditions. A significant main effect of implicit alcohol-related valence (IAT-gb) was not obtained, F (1, 82) = .01, p = .91, partial η^2 < .001, with implicit alcohol-good associations becoming stronger after an emotion induction. Marginal means of participant IAT-gb scores at baseline and post-emotion induction are depicted in Graph 2 (see Appendix 6). A significant main effect for condition was not found, F (2, 82) = .99, p < .001, partial η^2 = .52. The interaction of condition on strength of alcohol-good associations was non-significant, F (2, 82) = .57, p = .57, partial η^2 = .01.

Predicting Alcohol-Related Problems (exploratory aim)

A series of standard multiple regression analyses (MRA) were conducted to examine the relationship between strength of implicit alcohol-related cognitions and self-reported problematic alcohol use and alcohol-related negative consequences as predictors. Prior to interpreting the results of the MRA, test assumptions of normality and colinearity were evaluated and confirmed.

The first MRA revealed that, with all seven predictors, problematic alcohol use and negative consequences of drinking accounted for 6.7% of variability in implicit alcohol-good (valence) associations, $R = .26$, adjusted $R^2 = .035$, $F(7, 201) = 2.08$, $p = .05$. As can be seen in Table 3, the experience of physical consequences as the result of drinking was negatively weighted, indicating that those who report less negative physical alcohol-related consequences hold more positive alcohol-related associations. Self-reported problematic drinking and negative consequences of use, specifically related to interpersonal and intrapersonal functioning, impulsiveness and lack of control, and difficulties upholding social responsibilities, were not significant contributors to the model.

The second MRA revealed that, with all seven predictors, problematic alcohol use and negative alcohol-related consequences accounted for a significant 8.7% of variability in implicit alcohol-approach (motivation) associations, $R = .29$, adjusted $R^2 = .053$, $F(7, 189) = 2.56$, $p = .02$. Self-reported alcohol-related experiences involving physical injury and intrapersonal problems were negatively weighted, while self-reported problematic drinking was positively weighted. This indicates that those who report more instances of physical and intrapersonal consequences after consuming alcohol as well as those with problematic drinking practices are more likely to exhibit weaker alcohol motivations. In

contrast, alcohol-related interpersonal problems, problems with impulsivity and a lack of control, and difficulties upholding social responsibility were not significantly predictive of implicit alcohol motives (see Table 4).

DISCUSSION

Alcohol use disorders are affecting a wider range of people each year. Studies have found that implicit measures of alcohol attitudes are predictive of alcohol use behaviors, and later alcohol abuse and use disorders. Implicit associations have been found to predict interpretations to ambiguous situations. For instance, following an emotion induction, coping motivated drinkers associated negative emotions as alcohol-related, while enhancement motivated drinkers were found to implicitly associate ambiguous positive moods with alcohol (Salemink & Wiers, 2013). Past research has found that mood inductions have an effect on a person's implicit perceptions of alcohol, their desire to consume alcoholic beverages, and their overall warmth toward alcohol (Ostafin & Brooks, 2011). However, there is a lack of support for such findings. The present study aimed to examine the effects of an emotion induction on a college student's implicit alcohol valence and motivation cognitions.

Due to a lack of power and a small sample size, we were unable to find significant results regarding how a mood induction influences implicit scores, thus we were unable to support our hypotheses. However, results showed that positive-valence implicit alcohol-related associations were correlated with self-reported social, coping, and enhancement motivations, as well as problematic drinking and problems controlling use, whereas implicit drinking motivation associations were correlated with impulse problems. These findings support previous research on implicit alcohol motivations, particularly how stronger implicit alcohol associations lead to higher chances of alcohol-related harm caused by impulsive actions, difficulty controlling consumption, and drinking to cope with negative emotion (Caudwell & Hagger, 2014; Grant, Stewart, & Birch, 2007). While

implicit alcohol associations were found to correlate with implicit drinking motivation, impulsive choices have also been found to significantly increase risks of coping-motivated drinking in college students with elevated social anxiety (Keough, Badawi, Nitka, O'Connor, & Stewart, 2015).

Correlational analyses revealed underlying relationships between alcohol-good (valence) associations and drinking motivations. Those with higher alcohol-good attitudes were more likely to drink based on social motivational factors, to alleviate negative emotion, and to enhance positive emotion. Those with higher alcohol valence attitudes were also more likely to engage in problematic drinking behavior (e.g., binging). This relationship is consistent with previous findings. For instance Cooper (1994) found young adults who drank in order to reduce negative emotion and/or to avoid social rejection were at risk for alcohol-related incidents, such as vomiting and alcohol-related injuries, and engagement in problematic drinking. Cox and Clinger (1988) also found that drinking to reduce negative emotion leads to maladaptive coping practices, including alcohol abuse and dependence. If participants in the current study continue to drink to alleviate negative emotion while also engaging in problematic drinking practices, they are more likely to develop detrimental coping practices and alcohol-related problems long term.

While the emotion inductions did not cause a significant change in implicit alcohol associations, they effectively influenced mood in both the negative and positive conditions (conditions 1 and 3, respectively). It is possible that the changes in implicit associations were insignificant largely due to the small sample size alongside the high attrition rate. Within each condition, it was not possible to further separate individuals

based on their primary self-reported reason for drinking to test the original hypotheses. Previous research has found that mood inductions have impacted implicit alcohol-related associations such that coping-motivated drinkers exposed to negative mood inductions and enhancement-motivated drinkers exposed to positive mood inductions report stronger implicit alcohol-approach attitudes (Grant, Stewart, & Birch, 2007). It is possible that with an increased sample, the emotion induction could have shown a significant impact on implicit alcohol-good and alcohol-approach associations that are dependent upon a person's primary reason for alcohol consumption.

The nonsignificant results of emotion on strength of implicit alcohol-related cognitions could have been skewed by the external (social) motivations driving the majority of participants to drink, instead of internal emotion regulation motivations. The current sample was primarily socially motivated to drink rather than coping-motivated, so those induced with negative mood recordings would not have responded as drastically as coping-motivated drinkers. Social-motivated drinkers have exhibited generally unproblematic drinking habits, with lower rates of alcohol use disorders and drinking-related problems (Merrill & Read, 2010), while coping-motivated drinkers have exhibited more impulse problems and increased risks of long-term alcohol use disorders.

An exploratory analysis revealed that the strength of implicit alcohol-related cognition could be predicted by a history of problematic alcohol use and negative alcohol-related consequences. Specifically, those that experience less physical consequences related to drinking were more likely to associate alcohol with positive attributes. Problematic alcohol use and negative alcohol-related consequences predicted variability in implicit alcohol-approach cognitions, which is consistent with recent

research as well (Lindgren et al., 2015). Those that reported less alcohol-related physical consequences and intrapersonal problems demonstrated stronger alcohol-good associations. Furthermore, participants with problematic drinking practices were more likely to have strong alcohol-good associations. When someone experiences little to no repercussions to their actions (in this case—consuming alcohol), they are more likely to continue to replicate such activities. This, in turn, increases the drinker's tolerance, thus increasing the amount one must consume in order to receive the same emotions, which may strengthen their associated implicit alcohol-related cognitions. As the alcohol consumption increases, they become more vulnerable to alcohol-related consequences like injuries, interpersonal and intrapersonal problems, as well as failure to fulfill responsibilities.

Limitations of Current Study

Several limitations potentially affected the results of the study. A small sample size in phase II (N = 88) decreases the generalizability of results to populations outside of college students. A high attrition rate (59%) lessened power, which increased the likelihood of making Type II errors. Additionally, the majority of participants were under the legal drinking age, so the results may misrepresent the general population. While participants voluntarily participated in the study, they were awarded credit for their participation based on if they were present to complete the study, not on if they responded to the best of their ability. If participants were not focused on the tasks presented to them, the data would not represent their true implicit associations and the results of the emotion induction.

Limitations in implicit association measurements used in the study could have also influenced the results. Implicit associations have notably been difficult to measure accurately, as seen by the lack of significant results when comparing implicit alcohol motivations (IAT-aa) with drinking motives (DMQR), problematic drinking (AUDIT), and self-reported consequences associated with drinking (DrInC). It is possible that the study inaccurately measured implicit associations between alcohol and drinking motives.

It is also possible that the structure of phase I, particularly the placement of the Self-Assessment Manikin (SAM), altered the results. By having the participants report their emotion after completing the writing prompt, it is possible that their prompt topic influenced their SAM rating, thus influencing the comparison to responses in phase II. Data collection was spread out over several semesters. In the primary stages of data collection, error on the part of research assistants caused several participants to be administered duplicate implicit association tests in phase I (e.g., two IAT-gb instead of one IAT-gb and one IAT-aa), leading to the differences in alcohol-good and alcohol-approach sample sizes.

Future Directions

A larger sample size would greatly benefit the study. Ideally, every condition would have sufficient participants to be further divided into coping-motivated drinkers and enhancement-motivated drinkers to further examine the differences in implicit associations. This division would better replicate the findings of Ostafin and Brooks (2011), hopefully confirming the different impacts of mood inductions on implicit alcohol associations for enhancement-motivated drinkers and coping-motivated drinkers. In order to better address the impact of such emotion inductions on implicit associations,

removing the neutral condition would allow future research to be focused directly on negative and positive emotion inductions. Future studies could also examine the dynamics of social drinkers with external drinking motives, such as drinking to conform to social expectations or to enhance social experiences. These drinkers have been found to have less long-term problems caused by their alcohol consumption (Merrill & Read, 2010), so future research could explore why those drinking for social reason are less likely to have alcohol use disorders after repeated drinking episodes.

As well as examining the potential consequences of alcohol use for socially-cued drinkers, future research could examine the implicit associations of coping-motivated drinkers and the self-reported consequences and motives behind their drinking. Comparing the differences between coping-motivated and social drinkers could uncover details beneficial to rehabilitation processes, such as how to redirect implicit associations for those drinking to cope towards more healthy alternatives.

Conclusion

Due to a small sample size, high attrition rate, and low power, the current study was not able to find a significant impact of emotion inductions on implicit alcohol associations. Though the emotion inductions did not significantly alter participants' cognitions, the study discovered meaningful relationships between drinking motivations, self-reported negative alcohol-related consequences, problematic drinking, and implicit alcohol-related cognitions. These results suggest that individuals who hold stronger positive alcohol-associations and drinking motivation have not experienced negative consequences of alcohol use, particularly in relation to physical or mental health problems. Individuals engaging in more sociable drinking, in contrast to hazardous

problematic drinking, also appear stronger implicit drinking motivation. The current sample consisted primarily of socially-motivated drinkers, thus the results may not be truly reflective of the impact of emotions on an individuals desire to drink; rather, the current sample may be less apt to drink for emotionally-laden reasons. These results can be used in future research regarding alcohol use, abuse, and alcohol use disorders in college populations.

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APPENDIX I

BLOCK	1	2	3	4	5
PHASE I	Random Assignment to condition (1, 2, or 3) Informed Consent	*(note: IATs administered in random order)* Complete baseline IAT-gb and IAT-aa	Completion of the guided imagery script	*(note: measures randomized)* SAM (1) AUDIT DrInC DMQ-R	Partial Debriefing Follow-up instructions for Phase II
PHASE II	Informed Consent SAM (2.1)	Completion of the 5-min Emotion Induction Task (matched to participant ID and condition)	VIS SAM (2.2)	*(note: IATs administered in counterbalanced order from Phase I)* Complete post-emotion induction IAT-gb and IAT-aa	Full debriefing

APPENDIX 2

Table 1: Summary of correlational analyses for measures used to gauge implicit alcohol associations, problem drinking, and alcohol-related consequences

MEASURES	1	2	3	4	5	6	7	8	9	10
IAT-aa (phase I)	---									
IAT-gb (phase II)	.468**	---								
AUDIT total	.122	.145*	---							
DrInC_Impulse	.159*	.117	0.662**	---						
DrInC_Responsibility	.72	.108	0.616**	.678**	---					
DrInC_Control	.109	.152*	0.621**	.550**	.434**	---				
DrInC_Physical	-.012	-.005	.686**	.678**	.725**	.531**	---			
DrInC_Interpersonal	.048	.040	.642**	.762**	.733**	.492**	.750**	---		
DrInC_Intrapersonal	-.044	-.048	.560**	.879**	.610**	.366**	.678**	.693**	---	
DrInC_Total	.061	.053	.734**	.879**	.849**	.556**	.876**	.905**	.815**	---

Note: (*) significant at $p < 0.05$; (**) significant at $p < 0.01$

APPENDIX 3

Table 2: Summary of correlational analyses for measures used to predict drinking motives, problematic drinking, and implicit alcohol associations.

MEASURES	1	2	3	4	5	6	7
DMQR_social	---						
DMQR_coping	.597**	---					
DMQR_enhance	.806**	.575**	---				
DMQR_conformity	.419**	.403**	.326**	---			
AUDIT Total	.637**	.492**	.632**	.303**	---		
IAT-aa (phase I)	.084	.083	.067	.005	.135	---	
IAT-gb (phase II)	.166*	.181**	.194**	.100	.180**	.460**	---

Note: (*) significant at $p < .05$; (**) significant at $p < .01$

APPENDIX 4

Table 3: Summary of Multiple Regression Analysis for Problematic Drinking (AUDIT) and Self-Reported Drinker Consequences (DrInC) Predicting Alcohol-Valence (IAT-gb) Associations

	Unstandardized Coefficients		Standardized Coefficients
	B	Standard Error of B	β
AUDIT Total	.011	.008	.153
DrInC_Physical	-.046	.021	-.217*
DrInC_Interpersonal	.011	.025	.046
DrInC_Intrapersonal	-.017	.021	-.067
DrInC_Impulse	.011	.015	.067
DrInC_Responsibility	.039	.027	.131
DrInC_Control	.010	.010	.089

Note: R^2 = .067 (N = 208, p < .05); (*) significant at p < .05

APPENDIX 5

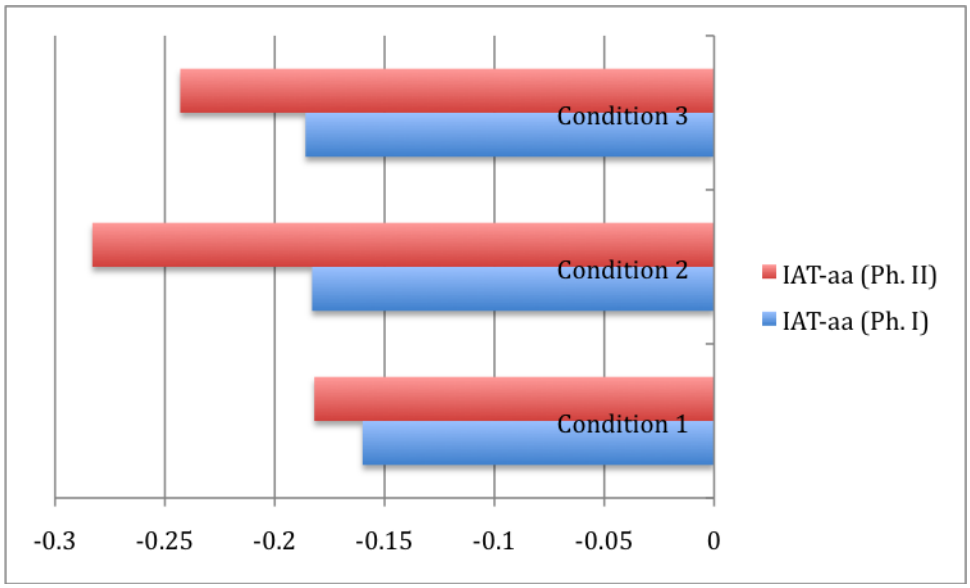
Table 4: Summary of Multiple Regression Analysis for Problematic Drinking (AUDIT) and Self-Reported Drinker Consequences (DrInC) Predicting Alcohol-Approach (IAT-aa) Associations

	Unstandardized Coefficients		Standardized Coefficients
	B	Standard Error of B	β
AUDIT Total	.018	.008	.247*
DrInC_Physical	-.045	.021	-.226*
DrInC_Interpersonal	.001	.025	.003
DrInC_Intrapersonal	-.051	.022	-.204*
DrInC_Impulse	.017	.015	.117
DrInC_Responsibility	.009	.028	.030
DrInC_Control	.007	.010	.064

Note: R^2 = .087 (N = 196, $p < .05$); (*) significant at $p < .05$

APPENDIX 6

Graph 1: Marginal Means of Participant IAT-aa Scores in Phase I and Phase II



Graph 2: Marginal Means of Participant IAT-gb Scores in Phase I and Phase II